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ABSTRACT

This paper examines the potential impact of technology on postsecondary rural education, based on the experiences of people currently using technological delivery systems. Migration and economic dislocation of rural communities increases the need for educational services, while state resources generally have decreased. Technological solutions to providing distance education to rural adult learners has become increasingly attractive. Technology, which has reshaped the rural economy, can have the same affect on the structure and content of rural education. But the parameters of this reshaping are still undefined. High technology could be oriented toward a select group of highly motivated remote learners, or toward a variety of educational and training needs within the rural community. Technology can deliver instruction, but the context in which that instruction takes place also plays a role in its success. Technology can give access to postsecondary education for rural learners, but there are equity and quality issues. Policies that take such issues into account can broaden educational opportunities for a large number of rural learners. This paper takes the position that technology must be viewed not as a solution to the problem of distant learning, but rather as a tool for solving educational problems related to distance (Turner 1986). Policy issues that influence the outcome of high tech delivery are identified and discussed. (Author/TES)

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Some Potentials and Limitations of Technology in Serving Rural Postsecondary Learners

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Some Potentials and Limitations of Technology in Serving Rural Postsecondary Learners

Rural communities are experiencing rapid and disorienting change on a global scale. Rural outmigration and economic dislocation are changing the face of the countryside. Those communities dependent on natural resource based industries are perhaps most severely affected. As traditional forms of employment and work/family structures become less successful, educational resources become more critical to the future of both communities and individuals. For most states this has meant that the need for educational services is skyrocketing at the same time resources to meet the additional demand are decreasing. Given these circumstances, technological solutions to providing distance education to rural adult learners are increasingly attractive to both learners and providers alike.

Just as technology has helped to shape and reshape the economy and social structure of U.S. agriculture as well as the nonfarm economy, it has the potential to reshape the structure and content of rural education. The paraments of this reshaping process are not yet defined. The introduction of high tech could lead to a system oriented to a select group of highly motivated remote learners building on successful educational experiences, or to one that focuses on serving a variety of educational and training needs within the rural community by blending and mixing a number of different systems and sources of expertise.

The technological approach to delivering rural postsecondary education is not as clear cut as it might seem. Technology can provide a means for delivering instruction, but the context in which that instruction takes place also plays a role in the success of a high tech course. Technology can increase access to postsecondary education for rural learners, but these systems also interact with equity and quality issues. Policies that control this interaction in a constructive manner have resulted in successfully broadening educational opportunities for a large number of rural learners. Technology implemented without concern for the learners has, on the other hand, left many would-be adult learners discouraged and unwilling to negotiate the postsecondary system.

This paper will examine the potential impact of technology on postsecondary rural education based on the experiences of those currently using technological delivery systems. It will take the position that technology must be viewed, not as a solution to the problem of distant learning, but rather as a tool for solving educational problems related to distance (Turner, 1986). This tool can impact either negatively or positively both the quality of the educational experience for rural learners and the equity of the educational outcome. Policy issues that influence the outcome of high tech delivery will be identified and discussed.

Technology and Education: An Overview

How technology affects the educational process is a question of some debate. There are many articles and not just a few books written on how the introduction of new technology has improved student performance. In particular, the army and the private sector (IBM and Texas Instruments) have invested time and money in both developing new techniques for learning utilizing video, computer, and telephone technology and in evaluating the results of these new techniques. Some articles indicate that student performance in reaching educational objectives improves greatly with instructional technology (Seldon and Shultz, 1982; Hodgetts, 1983; *Training*, April 1984; Hirschbuhl, 1982). Most observers have remained skeptical. And, indeed, an article published in the winter 1983 issue of *Review of Educational Research*, written by Richard E. Clark, provides support for this skepticism. Clark argues that

> most current summaries and meta-analyses of media comparison studies clearly suggest that media do not influence learning under any conditions. Even in the few cases where dramatic changes in achievement of ability have followed the introduction of a medium, as was the case with television in El Salvador (Schramm, 1977), it was not the medium that caused the change but rather a curricular reform that accompanied the change. The best evidence is that media are mere vehicles that deliver instruction but do not influence student achievement any more than the truck that delivers our groceries causes changes in our nutrition. Basically, the choice of vehicle might influence the cost or extent of distributing instruction, but only the content of the vehicle can influence achievement (Clark, 1983; 445).

Many practitioners disagree with this thesis that educational technology is only a delivery mechanism, but they would not necessarily quarrel with his finding that the quality of the content is what influences successful learning. Practitioners argue that educational technology does not invalidate what we know about how students learn. Indeed, the use of technology has increased attention to the elements of good curriculum design and development. In this sense, a technological delivery system is much more than just the truck that delivers the vegetables. Technology can

develop a system that can get the right produce to the right place at the right time, increasing the potential uses and applications of those products. In addition, just as the development of better, more sophisticated tools has changed the structure of work in many other areas, the development of high tech educational tools will necessarily interact with the content and process of education. This interaction will produce new systems of educational delivery within which the educational content itself will have undergone some change. For example, the use of computers in problem-solving activities has helped students not only analyze information, but also actually generate new knowledge (FTSG, 1986).

The research indicates that curricular revision must be undertaken very seriously in the development of high tech delivery systems. One reason for this emphasis is that using high tech delivery systems strips the course experience of all the support systems commonly taken for granted by students and faculty. Distant learners watching a video or taking a class by computer are not able to access either their peer group for interpretation or the teacher for clarification. Even those taking classes via two-way video who can interact with their teacher and their peers often continue to feel isolated. The process of redesigning classes for high tech delivery must broaden and deepen the traditional classroom presentation to make up for the isolation of the learner. Curriculum redesign is, perhaps, among the most critical elements influencing the success of a program.

Technology and the Learning Process

The impact of technology on learning is two-fold. It forces attention to effective curriculum design and development, but it also provokes new interest in and tools for bettering our understanding of the learning process itself (Hobbs, 1985). Indeed, one of the most remarkable capabilities of new technology is its ability to foster and facilitate experimentation in developing new and better teaching tools (Hart, 1983).

Several studies have shown that computer-based instruction, computer-assisted instruction, and interactive video classes decrease the amount of time students need to achieve specific learning objectives. In addition, technologies that combine a number of mediums—listening, seeing, and reading—are often more effective learning tools. In these cases, the learner who may not listen well has the information supplemented with visual and written materials. Other learning theorists suggest that such combinations of information delivery increase student retention (Emery and Schekel, 1984). When students are able to supplement listening, reading, and seeing with doing on a computer or with interactive videodisk simulation, retention is likely to be very high.

New technologies also offer opportunities to develop situations where students can develop and improve their problem-solving and decision-making abilities. Simulations of situations, such as those used to train intensive care nurses, help students practice making on-the-spot decisions or tracking down problems with patient care. The Florida Department of Social Services has replaced on-site training with interactive video programs. IBM has also replaced some of its training with interactive video. Such real-life learning environments have not been available to students without the new technology.

The introduction of high tech delivery mechanisms into course development requires an evaluation of how that course content structures the learning process. Learning objectives and activities must be carefully analyzed and often redesigned. In order to develop learning activities that can be successfully delivered via high tech, planners must draw from the research on what makes an effective class, as well as from the materials on how people learn.

Incorporating these ideas into educational programs for distant learners requires a knowledge of the learner population, information on similar programs that have worked successfully in the past, and a great deal of creativity. This process often provides instructors with useful information on curriculum development that can be applied to all future teaching. As the technology becomes cheaper and more widely available, more instructors are experimenting with new delivery mechanisms and with combining a variety of mechanisms to develop new and exciting educational programs.

Technology and Rural Postsecondary Education

The experience of learners and practitioners using technology in rural postsecondary educational programs are varied. New technologies have, without a doubt, improved access to rural postsecondary education for a number of students. Telecommunications projects have made education a real possibility for villages in Alaska, have brought credit courses to rural residents in California, and have provided place-bound adults with educational programming on their home TV sets.

A recent survey of practitioners and learners involved in rural postsecondary education in the Northwest found that students and practitioners alike voiced reservations about the continued expansion of new technologically sophisticated delivery systems (Gray, et al., 1986). They identified instructor/student interaction as a key element in the success of high tech educational delivery. These advanced telecommunications and computer projects will only pay off when the number of students is very large and and instructor time remains minimal, and it is precisely this aspect of reduced instructor contact that rural learners disliked. Students and practitioners also expressed concern about the use of technologies that maintain rather than alleviate isolation on the part of the learner. Despite these concerns about distance delivery education, rural learners identified the lack of telecommunications alternatives as a barrier to obtaining postsecondary education.

These findings indicate that applying new technologies to an educational situation will only increase results if:

1. it results in revising the curriculum,
2. it decreases the cost of the educational offering, and/or
3. it expands the potential audience for an educational program.

All of these points are relevant to rural postsecondary education, but the last two are most commonly rationales for introducing new technologies into existing delivery systems. The first point on the effect of technology on curriculum, however, critically impacts the success of technology in reducing costs and expanding audiences. Without curriculum appropriate to the medium, classes cannot be successfully transmitted to new audiences.

Clearly, new technologies have improved access for rural adults. However, questions about the cost and the quality of these services remain. The cost of many of these programs is very high, and the vast majority of such programs have been underwritten by grants or special funding from the state. Costs promise to decrease with the expansion of existing systems and with the development of lower-cost equipment, but involvement with the new technologically sophisticated delivery systems remains a major investment. Not only must an instructor be paid as with any course, but also technicians, equipment and curriculum consultants are included on the payroll. More and more often outreach workers or site facilitators are also being added to the list. Subsidies are likely only for special populations with access to special funds, as with the Alaskan native population and the village educational system.

In summary, the research shows that technology can play an important role in the future of rural postsecondary education. It is a role that can bring new opportunities to rural learners who previously have encountered significant barriers to attending classes. However, when new technology is used to overcome the barriers related to distance and geography, students often remain isolated from their instructor, classmates, and campus support systems. Planning that includes curriculum revision and redesign and support for instructor/student interface is critical to the success of these programs.

Technology and the Search for Excellence

The development of educational technologies has been motivated by a search for universal excellence for all students. Lessons designed by experts in one location could "do for every child what once could be done for only a few" (Hofmeister, 1983). The development of systems like the British Open University translates this ideal to the postsecondary education system. Today the American system of higher education is under review. Among the criteria for evaluating postsecondary education are the issues of access to opportunity, equity in the potential to achieve equal outcomes, and quality of the educational experience. Often the development of educational policies reflects competing values of equity and access, and quality and choice. Rural postsecondary education has fallen victim in many cases to efficiency and choice as funds for increasing access and equity have been difficult to acquire. Technological solutions to problems in rural postsecondary education reflect these same dilemmas as money is made available for hardware/software that provides some choice and some access, but funding to make the system work for rural learners in general or for faculty development to improve course design is absent or severely limited. A goal for improving rural postsecondary education with educational technology must include concern for access, equity, and quality instruction.

Technology and Access

The most common rural education application of technology is to provide learning opportunities to adults place-bound because of geography, weather, and/or distance. A variety of systems makes it possible to transcend these variables, including audioconferencing, computer conferencing, video and audio courses, interactive video/computer systems, two-way video, computer-assisted instruction, and networked computer systems. Each of these systems allows the learner to take courses while residing in a location different from that where the actual instruction takes place or originates. These systems are not specific to rural learners, and, indeed, in many cases most of the learners participating in a particular form of distance education are urban. However, these systems often provide the only access for rural learners. Some examples are:

- University of Alaska provides instruction to remote villages via satellite.
- Cooperative Extension in Alaska offers workshops and seminars via audioconferencing.
- The Fred Meyers Charitable Trust is funding a project to create a desk-top computer version of the WLN database—one of the largest automated library catalogs in the world.
- The July 1986 issue of *Family Computing* lists five sources for taking courses via computer link up.
- Many rural adults take courses that are shown on public broadcasting stations.
- Microwave allows Chico State College to broadcast courses to a number of different locations where students can interact with the instructor via audio link-up.
- Computer software gives adult learners at Piedmont College an opportunity to work on basic skills in several locations.
- The Minnesota Extension System has all of its slide shows on a laser disk.

Access Issues

The advantage of these systems is that they do provide a means by which rural learners who cannot attend a college campus can receive a college education. Technology is not, however, a panacea for

problems related to access. A number of factors interact with the technology to affect the accessibility of courses delivered by high tech.

Learner Background: The application of technological delivery systems often requires learners to have already reached a certain level of technological expertise. Currently, most computer-assisted instruction and computer video interface require specific hardware on both ends and the training to use that hardware. Future applications can eliminate the training through use of the touch screen or voice command, but computer phobia will remain a hindrance unless confronted in orientations or training sessions. Learners with no prior computer experience as well as those with computer anxiety have difficulty in accessing these systems.

Infrastructure: Many rural adults live in areas where the poor quality of phone lines prevents them from participating in activities that require the transmission of data via phone. In addition, party lines add to the difficulty many rural adults face in taking advantage of computer or audio conferencing programs.

Cost: Perhaps the most limiting factor related to the technological delivery mechanisms is cost, both that of the hardware as well as of development. Development expenses spread out over time often appear manageable. But the bulk of these expenses occur in the first year as the instructional program is developed. These first-year expenses are often difficult to acquire.

Technology and Equity

Technology can make a difference in access, but access alone does not constitute a solution to the problems of equity. A number of states have provided funds for large microwave systems that can broadcast educational classes. However, it is not unusual for these systems to focus exclusively on graduate education or professional development in engineering or other high tech fields. This same system could be expanded to offer classes to a wide variety of adults in a number of different fields. The ability of individuals and groups of individuals to take advantage of these opportunities is clearly a question of equity.

Just as technology can increase access to course offerings for rural learners, it can play a role in achieving equity goals that encompass the entire rural population including women, minorities, and disabled learners. However, because of the levels of expertise involved and the high costs associated with high tech, the introduction of technology into systems serving rural adult learners may, on the other hand, exacerbate problems related to equity by making educational opportunities available only to those with satellite dishes, VCRS, previous educational experience, or some combination of the three.

Equity Issues

Equity concerns range from adequate funding for systems to reach all potential populations to curriculum issues about who gets access to what types of courses. Common to all concerns is the problem of providing potential learners with the skills and confidence to take advantage of the educational offerings to which they have access.

Funding: As with access, funding is also a factor with equity issues. While technology can bring new opportunities to rural learners, the cost of that technology can result in those areas with less resources being left out of new systems. As more and more course work is available via high tech systems, those without access to these systems will become relatively more disadvantaged. Course topics that do not command the interest of potential funders will also become less available despite their importance to small groups of learners. Finally, many learners do not have the background, skills, or inclination to work within these new systems. Often these learners are those who already are at some disadvantage in getting an education either because of their lower basic skill level, ruralness, lack of self-confidence, or cultural/racial differences.

Learner Support: If access alone does not constitute equity, then distant delivery systems must develop support systems to encourage participation, particularly by disadvantaged students. One of the interesting findings in the Northwest Action Agenda research is that distant learners would also like to be able to use more of the support structures available to the campus-based student, including financial aid counseling, vocational counseling, and career planning services, as well as the cultural and general education programs (Gray, op. cit.). Many learners require help with computer literacy and basic skills. Students without keyboarding skills may need extra assistance in using new delivery systems that require digital inputs. They need the opportunity to work with others to create a community of learners with whom they can interact (FTSG, 1986). High tech has the potential to provide more of these support mechanisms, but there have been few efforts in this area to date. In this regard, outreach centers may be looking at the development of educational paraprofessionals who can facilitate discussions among students and provide an interface with campus services.

Technology and the Quality of Instruction

While access and equity are important to an educational system, the quality of instruction is critical to the success of any outreach system. Quality of the educational experience cannot necessarily be measured by standard tests. Adult learners often seek new learning experiences for reasons of their own, including application to work and home tasks. The value of these learning experiences cannot be evaluated on the basis of national tests. Furthermore, rural postsecondary experiences should not be judged by urban standards because the situation of many rural learners is unique and the role of the educational experience takes on a community context.

The goal of excellence includes quality interactive learning environments for all students. Access to CAI (computer-assisted instruction) or videotaped classes that lack a challenging and appropriate learning environment does not constitute a quality educational experience. Technology can only provide access and insure excellence in education when adequate funding, planning, and training are available.

Quality of Instruction Issues

A number of issues surface in a discussion on technology and quality of educational experiences. Curriculum is clearly an important element in this discussion, but equally important is attention to the learning environment.

Curriculum Design and Development: In examining the potential and limitations of technology on rural adults' learning, it is important to discuss the impact of technology on instructional design and development because the use of technologically sophisticated delivery systems affects the instruction itself. At Chico State, Media Center staff work closely with instructors to help them redesign their curriculum using high tech inputs. Assistance in redesigning classes and packaging new curriculum is essential to the success of high tech programs.

Real People: One of the driving forces in the development of high tech delivery systems is the desire to reduce the cost of services through reducing the labor involved (Morrison, 1983), or, more often in education, to expand the number served without increasing the labor costs. As the research mentioned indicates, rural learners have great reservations about using technology. They prefer working with "real" people. The experiences of colleges like Lewis–Clark State College indicate that it is not just a question of preference. Drop-out rates in courses that rely solely on high tech delivery mechanisms tend to be much higher than those of courses delivered in more traditional ways.

Thus, a key issue to surface in regard to learners is the need for the system to have real-people inputs as well as the high tech delivery system. Chico State has solved this problem in their rural outreach centers by using a system that allows students to interact with the teachers and to work with on-site monitors. Other colleges are also including some form of interactive communication between students and teachers. The aversion to high tech systems can also be overcome through on-site contact such as those at Eastern Oregon State College where facilitators provide real-people exposure.

Learning Environment: In addition to curriculum design and development and support for rural learners, the learning environment is also an important part of quality instruction. In this regard technology has not had a successful record. The July 27, 1983 issue of *Education Weekly* reports that over 90% of computer-assisted instruction is drill and practice. Similarly, many of the video courses available play back the standard college lecture and do not challenge learners to become involved in the learning process. These approaches are not effective learning interventions. Effective learning situations require mechanisms that allow the learner to control the technology rather than being controlled by it. Quality instruction has been defined as learning that actively engages the learner in the learning process. This poor record for using educational technology is not, however, the fault of the technology (conversation with Scott Fedale, U. of Idaho, July 28, 1986). Both video and computers, and especially interactive computer video, having the potential to create interactive learning environments through problem-solving scenarios and simulations.

Types of Technology In Rural Education

A variety of different technologies exists for delivering educational programs to distant learners. Some of them are mature technologies, that is, those which are not likely to continue undergoing change such as audioconferencing or videotape players, while others are emerging technologies, those experiencing rapid growth and development such as CD–ROM disks. Looking at educational technologies on a continuum from mature to emerging is helpful to planners and administrators in assigning funds and resources. Mature technologies are knowns that often cost less, but investment in emerging technologies may allow for more diverse use at a later time. One way of viewing these technologies is summarized below.

Educational Technology Continuum

Mature		Emerging
audioconferencing	audioconferencing with electronic bulletin boards	communications via fiber optics
video classes on tape	video classes via satellite or cable	interactive videodisk laser or CD–ROM disks, stand alone or sent via satellite, fiber optical strands, or microwave
computer assisted instruction: drill and practice	computer-based instruction	computer-driven instruction
		artificially intelligent learning systems
telephone lines	telephone bypass with cable	two-way cable
	analog microwave	digital termination systems
		satellite-to-station signals
	local networks	networks via multi-dimensional antennae to transmit and receive high bandwidth communications
	electronic blackboards electronic mail	networked computer conferencing

Technologies can be applied in a variety of ways. Many new systems are a mixture of several different technologies such as the University of Hawaii's video classes supplemented with an electronic blackboard system. Systems can be networked locally by direct wiring so that one master controls a number of stations, or via telecommunications so that a master system can provide programs in a number of locations at once. Stand-alone systems allow the student or faculty member to make use of the program when it is convenient with equipment available locally.

Transparency of Technology

Choosing the appropriate technology for a learning task involved knowing the potential development and use of a particular technology. When technology is a successful teaching tool, it should be transparent to the learner. That is, the lesson content should be the attention getter, not the tool that delivers it. The fascination with high tech tools and equipment often results in an inappropriate choice of technology for the learning task. For example, why use sophisticated computer conferencing when a phone call will do?

Factors Contributing to the Success or Failure of High Tech Systems

In reviewing high tech programs, a number of factors can be identified as contributing either to the success or failure of high tech delivery systems. Among those contributing to the success of high tech delivery are thorough planning, learner involvement in program development, access to support systems for learners, adequate funding and infrastructure, sufficient lead time, faculty development programs, and support for curriculum packaging and revision. Unsuccessful programs often have students learning in a vacuum without any structure to the learning environment, curriculum that has not been redesigned for distance delivery, lack of trained staff, lack of coordination among offerings, hardware acquisitions that weren't well planned for, and teachers who have not had an opportunity to overcome their technophobia. A more complete description of these factors can be found in the Appendix.

There are many limitations to the use of technology as we now see it used in rural postsecondary education. However, many high tech adherents point out that these limitations are not the fault of the technology, but rather a problem in how technology is applied. In many cases, technology is added to existing systems, as with transmitting standard lecture classes, without making adjustments to how using the technology changes the experience and without taking advantage of the technology's potential to create new and better situations. Below is a list of the ways technology can be used to overcome some of the limitations discussed earlier.

- Since 30% of American homes have VCRs (videotapes on how to fill out financial aid and admissions forms could be made available from public libraries for use on VCRs). Forty-five percent of television homes have cable so these programs could also be transmitted over cable stations.
- Interactive video systems could be made available for viewing campus events, participating in campus clubs, and participating in rap sessions sponsored by the counseling center.
- Instructor's office hours could be set up so that night students and distant learners could access them via telephone or computer.
- A laser disk with computer interface could be developed as an orientation session for distant learners that would include introductions to professors, an overview of campus clubs, a visit to the counseling center and the career placement center, and other orientation information.
- Students could be assigned an electronic mailbox number for getting information.
- Much of the information distributed on campus could be sent electronically and printed on-site upon request, eliminating the cost of printing unnecessary copies.

Policy Issues Related To Technology In Rural Education

A number of policy concerns surface from this discussion of technology in rural postsecondary education. These policy issues include regional, state, and institutional arenas.

Planning for Change

Comprehensive planning is perhaps the most critical element in making the use of high tech successful. Without proper planning and research into potential technological systems, users often find themselves unable to achieve the desired results. Successful planning efforts generally result from joint efforts of high tech experts, curriculum planners, potential users, and subject matter experts. According to Leon Martel (1986), mastering change in the Information Age requires:

- Networking to facilitate tasks and communications.
- Simulation of alternatives to problems in the planning and development of projects.
- Development of compatible interactive capabilities, particularly in regard to accessing electronic data bases (Martel, 1986, p. 59).

Martel's suggestions for mastering change with existing technologies include:

- Use extreme caution in assigning resources to mature technologies.
- Do not continue to give resources to one technology when a more effective technology exists (Martel, 1986, p. 286).

His suggestions for managing emerging technologies are:

- Put a high priority on discovering, creating, and exploring new technology.

- Work on understanding the implications of the emerging technologies, both the new opportunities and the new problems they may create (Martel, 1986, p. 286).

Training

The National Institute of Work and Learning reports that hardware/software purchases must be matched 100% by training for maximum productivity (Gudenberg, 1983). Clearly adequate training is essential to making technologically advanced delivery systems pay off. Appropriate training makes systems easier to access, increases the number of faculty and students using the system, and encourages the development of new applications for the existing technology. Thus, a clear policy recommendation is:

- Funding for training in using new technologiess, including faculty development, should match funding for hardware/software acquisitions dollar for dollar.

Three areas of training needs surface from this discussion on technology (FTSG, 1986)

1. Support for technological literacy, including computer literacy, for learners likely to access high tech.
2. Training in the use of technology as a tool in various content areas, including vocational and academic subjects.
3. Support for staff and faculty to become technologically literate and able to apply that technology to existing courses and work-related tasks.

Technological Literacy: A number of authors have identified training in the use of new technology including computer literacy as an important element of high tech programs. There are a number of reasons why this concern surfaces frequently. Computer literacy is important to developing confidence among learners so they will take advantage of new learning opportunities using computer technology. It is also important to job creation, job training, and the job search of many rural adults. Awareness of information technology is important to rural adults who have both much to gain and much to lose from the development of the Information Age (Hudson, 1984). Finally, new technology is likely to affect entrepreneurial businesses in rural areas as well as farm and ranch operations. Indeed, farm marketing and problem solving are even now being done via electronic communications (Goe, 1985).

Recommendation:

- As literacy is redefined to include skills in handling digital and electronic information, rural learners require access to programs that teach this new literacy. Support for developing and delivering classes on the new literacy is necessary to meet this need.

Training in the Use of Technology as a Tool: As mentioned above, the introduction of new technology into a course often requires revision in that course. Instructors require information on the capabilities of the system and on its potential application to the learning process in order to carry out such a revision.

Recommendation:

- New technology must be integrated throughout the curriculum by encouraging curriculum development and providing for faculty training in how new technology is affecting each field.

Faculty and Staff Development: Technology is rapidly becoming a major tool of the trade. Faculty and staff use technology to do word processing, research, and more and more often to perform administrative tasks. As telecommunications systems become more common, instructors can use technology to develop, deliver, and evaluate courses, to grade students, to send reports to the appropriate offices, and to use electronic mail, bulletin boards, and electronic networks for a variety of tasks. However, many faculty are not involved in these new developments either because of technophobia, a fear of being replaced by the technology, or a lack of reward for those who do spend time and resources learning about and using new technologies.

Recommendations:

- Faculty development programs should include training in how to use new technologies.
- Faculty reward systems should encourage faculty to become involved in using and developing educational applications for new technologies.

Access to training in the use of these technologies will result in better and more efficient use and a better pay-off for funders of new systems.

Management of Technology Transfer

The introduction of high tech into rural educational systems necessarily involves some technology transfer. Students who use video or computer-assisted instruction must learn about that technology to access those systems and presumably those skills would carry over into their work and home lives. Many rural people are already familiar with video and satellite communications because they own either a VCR or a satellite dish. The introduction of more complex technologies such as videodisk and computer-directed instruction will broaden student knowledge of technology.

The management of technology transfer in rural educational delivery requires special attention for several reasons. Technology transfer is likely to fail when potential learners are not involved in designing the transfer process (Meyer, 1983). Without rural learner involvement, planners are likely to overlook important considerations in the potential use of educational technology. Involvement in the planning and implementation process will create a sense of ownership and participation among isolated rural populations, enhancing the chances of success. Technology transfer has been known to create problems for new groups of learners if the technology inadvertently replaces existing systems. New technology can potentially have a variety of uses, but when local conditions and needs are not considered in the planning, this potential is wasted.

Recommendations:

- The ability of the infrastructure to carry high tech delivery systems must be researched. That is, are the

phone lines or satellite dishes capable of getting the information across without losing much?

- Planning processes must be broadened to include representatives of the learner population so that their needs and concerns are considered.

Collaboration

Both the incredible distances and enormous amounts of money involved in rural educational delivery systems make collaborative arrangements important and productive. Programs developed for outreach in one area can be easily used in additional areas assuming compatible hardware. Several methods of collaboration are commonly used.

1. A common method of collaboration is for the receiving institutions to buy the programs from the institution developing the program. For example, many colleges and universities have bought video courses developed through the Annenberg Foundation.
2. Partnerships among or between institutions involve joint planning and program development on particular projects. This is a particularly appropriate strategy where several institutions impact the same rural areas. The College of Agriculture at the University of Idaho has a partnership with the USDA to pilot a laser disk data base system.
3. Consortia provide a mechanism for continued collaboration on a long term basis. Typically, all members support the consortium's efforts at program development and implementation in a particular project. A number of educational institutions have joined consortia to spread out development costs on high tech projects. The Western States Computer Consortia involve members from land-grant institutions who are looking at the future use of technology in extension and research.

Recommendations:

- Planning for high tech delivery systems should be done by the institution as a whole, so that resources can be maximized.
- Planning should also include representatives of other institutions so that collaboration across institutions is possible.

Development of Outreach Support Systems

Learners responding to the survey developed by the Northwest Action Agenda Project identified the decision to return to school as critical to overcoming barriers to participating in crural education (Gray, 1986). Support services that aid students in carrying out that decision were also critical. Distance learners find themselves removed from the institutionalized support found on college campuses and, thus, much more dependent on community support systems. While families and friends can help with many of the problems experienced by rural learners, they cannot fill the void created by missing the campus connection to counseling: academic, vocational, financial, and personal (Gray, 1986.) Outreach programs relying on high tech delivery systems need to develop methods of bringing that support system from campus to the rural learner to facilitate their learning and to decrease the number of potential drop-outs. Outreach workers require training to be successful as facilitators and as sources of information on financial aid, academic requirement, and vocational opportunities. Educational paraprofessionals can make an important contribution to the success of high tech programs.

An additional area of outreach support equally important, but perhaps more amenable to technological tools, is the development of access systems that permit distance learners to access libraries and other data bases for information and research potential. Eastern Oregon State College has been working on making bibliographic information available to anyone who can link to their system. Other avenues for expanding access to libraries include using public libraries that can link to university and college library systems. The University of Hawaii has linked students with NASA's research laboratory enabling them to access information for a radio astronomy course. In cooperation with the National Museum of Air and Space in Washington, the University of Hawaii has offered students a teletour of the museum.

Recommendations:

- The development of outreach centers and training for outreach staff should accompany the development of high tech delivery systems.
- Planners should include attention to support services in developing distance delivery systems.
- Electronic access to libraries will become more important and will require funding for development and training for staff and students.

Blending of Systems

High tech delivery systems tend to be located in individual departments or institutions where the view of the rural educational problem or the potential use of the high tech system is necessarily restricted. Both funding considerations and the varied needs of rural learners require administrators to go beyond their institutional or departmental concerns and think about ways services can be blended to produce articulated curriculum choices for academic learners. Some areas are beginning to work with this concept by locating more than one institution in an outreach center where they can better work together to meet needs. Thus, some outreach centers offer vocational extension courses, telecourses, audio courses, and correspondence study from several institutions. Rural learners are then able to access an articulated curriculum drawn from several institutions.

Recommendation:

- By assessing student needs and working with other institutions, outreach centers can provide comprehensive educational programs.

Funding

Funding is perhaps the biggest problem for those working with high tech educational programs. The hardware cost of many systems is very high and the labor costs of other methods of delivery such as video and audiotape are also high. Many programs suffer from inadequate funding. States, institutions, or outside funding sources have contributed funds for the acquisition of hardware, but monies are not available to train staff or for curriculum design and development. Local support systems are left to existing budgets. As a result, many projects are not as successful as expected and the institutions, funding sources, and learners alike become disillusioned with high tech programs.

The difficulty in acquiring adequate funds for large telecommunications projects has made the practice of developing consortia more attractive. Many funding sources are more willing to fund groups of institutions rather than single colleges because they feel their money will go further. In addition, by pooling labor resources, consortia can keep down the costs of training.

One of the most crucial needs in rural educational technology is the need for local support systems. This need is also the most difficult for which to find funding. Once the hardware is in place, the assumption is that people will automatically take advantage of it and that it will meet all needs. As this paper has indicated, this scenario is far from the truth. Rural learners require real people to deal with and access the variety of support services typically available to on-campus students. Filling this need takes money. However, in terms of streamlining the system and preventing drop-outs, money allocated to this need can pay off. Cost sharing on large delivery systems and networks makes more money available for local concerns, including support mechanisms at the receiving end of the high tech system.

Recommendations:

- Time and resources can be saved if efforts to develop technologies on campus take place with prior knowledge of possible off-campus use.
- Funding for the development of large telecommunications projects often must come from a variety of sources, thus suggesting the value of working in a consortium.

Administrative Concerns

Administrators play a key role in the development of high tech delivery mechanisms. For many, the development of such systems to reach rural populations has become more important as their traditional student body declines. When administrators play active roles in the development of collaborative efforts to use technology to meet rural learners' needs, programs are likely to have more stability and support than when these collaborative efforts exist within individual departments or among a particular professional group (FTSG, 1986).

As colleges and universities become more involved in developing programs for distant learners, their faculty often remain uninterested. Faculty support in curriculum redesign and development and incentives for those who do become involved are important to the success of such projects.

Above all, new systems of educational delivery, both on campus and off-campus, require a willingness to be flexible. New time schedules, new mechanisms for student to register and receive academic support are necessary. Indeed, the option to take a three-credit class over the course of a semester in several days in a self-paced setting will require new ways of viewing students, the learning process, and the academic career itself.

Recommendations:

- Administrators must be actively involved in bringing together the appropriate groups of people to plan for the implementation of high tech systems.
- Flexible time schedules, office hours, and methods of assessing student work must be developed to accommodate new students using high tech systems.
- Methods need to be developed that will assure equal treatment of distant learners in receiving financial aid, getting classes they need, and having access to campus support systems.

State-Level Concerns

Many state legislators are concerned with the large amounts of money high tech systems take. Particularly at a time when revenues are decreasing, a large investment in adult education can be difficult to justify. In addition, legislators and state boards of education are often hit with requests from a variety of institutions for big expenditures on high tech during the same funding year. Since technology is changing so fast, such large purchases can be out of date in a matter of months. Given these parameters, it is not surprising that these requests are passed over.

A number of states have developed statewide consortia to plan ways to implement technological systems in a cost effective way without overlap. Most of these consortia operate at the administrative level rather than at the professional level. Successful consortia combine administrative support with professional expertise to design and implement systems that cross institutional lines. Sharing delivery systems decreases expenditures and increases the number of potential users.

While state policymakers have involved themselves in development of high tech courses and the mechanisms for transmitting these classes, typically they have not become involved in the receiving end of the system. Policies that encourage the development of methods for helping students access libraries and other sources of information can have a statewide impact. In addition, policies that encourage coordinating offerings among institutions and providing counseling, financial aid, and other services would make the high tech system more effective.

Recommendations:

- Policymakers need to encourage collaboration among educational providers so that one cost effective system can have many uses.

- Policymakers need to insure equitable treatment of distant learners when making funding available for high tech delivery systems.

Professional Concerns

Individual professionals interested in distance education can also take advantage of high tech delivery systems. By working with local media departments and networking with other similarly interested professionals, it is possible to redesign courses for video, audio, interactive, and computer delivery.

Working with high tech delivery mechanisms will necessarily change both the professional role and the student role. Outreach workers and teachers need to be aware of these changes and sensitive to the needs of learners involved in this change.

Recommendations:

- Faculty and administrators need to take advantage of every opportunity to increase their knowledge and understanding of high tech.
- Faculty and administrators need to visit rural communities and learn about the needs and concerns of rural learners.
- Faculty need to be aware of how technology is producing new tools for use in their area, and they need to make this information available to students.

Community Concerns

Communities have a vested interest in the development of high tech delivery systems. For many communities, local access to educational opportunities makes that community more attractive to businesses and future residents. In addition, educational opportunity is thought to interact positively with economic development (Charner, 1985). Many communities would like to be involved in the planning and implementation of educational programs that affect their residents. In particular, basic skills and vocational needs can be identified on the community level. In addition, community input can be helpful in developing articulated curriculum for their members.

Recommendations:

- Community leaders need to encourage technological literacy among their residents.
- Communities need to develop leadership in identifying educational concerns and needs in their area.

Speculations on High Tech and The Future of Rural Postsecondary Education

The rapid rate at which technology is changing makes it difficult to predict the future shape of rural postsecondary education, but some speculations on what that future might look like are possible.

Imagine Lucy, a prospective learner living in a rural area. She wants to learn more about returning to school, so she visits her local outreach center where she can view a videotape about returning to school. This tape explains the variety of programs available and the steps she needs to take to make them available to herself. After talking with the outreach worker, she decides to investigate her possibilities by taking an aptitude test before deciding about a course of study. The outreach worker sets her up with a computer program that will automatically score her answers and transmit them back to the counseling center on campus. A message indicates that there is a counselor available to help her review her scores. The counselor asks for some more information, which Lucy inputs. She is, then able to discuss the outcome with the counselor over the phone. She decides there are several areas she is interested in knowing more about. Using a different computer program, she is able to access an updated list of jobs: their descriptions, the expected earnings, the possibilities of promotion, and the demand for that occupation in various locations. Both of the areas she is interested in require further training. Lucy decides to enroll. Lucy can watch another video that gives instructions on how to fill out an admissions form and a financial aid form. Lucy then makes an appointment with the outreach worker to attend an orientation session. Lucy's cousin who lives 45 miles out of town is also investigating returning to school. She is able to receive much of the same assistance via cable and through her computer link-up. New developments in cable TV allow her to dial up and request the educational programs she needs.

Lucy meets several other new and returning students, including her cousin, at orientation. They all have and opportunity to introduce themselves to the group and to explain their goals. The group then takes a tour of the campus, meets professors and administrators, learns about ordering books and using the library, and is introduced to a variety of program alternatives with an interactive videodisk program. Using a computer interface, they can select and view the areas they are most interested in learning about. The system also has a local information section stored on a floppy disk that describes rides for those who will be commuting to campus, local day care sources, and student club activities for each outreach center. The group sets up a schedule so they can meet twice a month during the first semester to help each other become accustomed to campus life. The interactive video stays at the outreach center so students can use it to answer questions and meet teachers throughout their student career.

Lucy will be taking three classes. Both she and her cousin will be taking a class offered over public television. Lucy will attend a discussion group session at the outreach center in person while her cousin will participate via telephone link-up. Lucy will come to the center to use a computer that will allow her to link up with the campus computer. Each time she logs on, she can access the instructor's lecture of any session she wants to look at, review assignments, upload her

assignment to the instructor, and read her instructor's comments. Her cousin can do the same thing with her home computer. Taking the writing course via computer allows her to get individual attention from her instructor and to proceed at her own pace. She can also get comments on her writing from her writing group, which has its own computer conference on the system. Since writing is something Lucy wants to learn to do well, she also attends a local writing group once a week. Lucy makes use of an electronic database to research possible articles and books for her paper. She is then able to request the selections she needs via interlibrary loan.

A third class, basic college math, is available via interactive videodisk. The disk stores a number of different math and accounting courses enabling the computer to find sequences that provide remedial help and review for a number of concepts, as well as teaching new concepts and skills. The interactive videodisk allows Lucy to see the instructor give the lesson in each concept, provides real-life simulation of how to use the concept, and follows each section with a computerized worksheet. The computer automatically scores the worksheet and suggest which portions of the tape Lucy should review. She also has access to the instructor's office hours by phone from her home or via two-way video at the outreach center. She prefers to go to the center because the discussion often improves her understanding of problems. For private consultation, she makes an appointment. She also takes her tests on the computer. The scores are transmitted back to campus, and she receives her grade back the same day.

In addition to taking classes, Lucy is interested in finding an interesting work-study position. Accessing the campus job network via the center's computer, she looks over the list and finds several jobs in which she is interested. One is to be a monitor at the center and help people use the equipment, set up meetings and group sessions, and answer questions. A local library job is also listed. She notes that there is a position for someone with computer access to work part-time for a campus department. This is something in which her cousin might be interested. Lucy sends in her application for the two jobs using the computer. Several days later there is a note in her electronic mailbox asking if she is available for an interview the next day. Since the people hiring for both positions include on-campus administrators as well as local staff, the interview will be conducted on two-way video. Lucy is excited about the opportunity and wants to be well prepared for the session. She logs on the computer and sends a note to the campus career center asking for information on interviews. That afternoon she receives a pamphlet sent electronically and printed out at the center on how to have a successful interview. She also has the name of a career counselor she can contact if she has any further questions.

Lucy found the section on campus clubs very interesting during the orientation and wants to become involved in the returning students' club. She sends an electronic message to the club's mailbox and receives information on club meeting times. Working with the outreach coordinator, Lucy is able to schedule the two-way system so she can participate. The interaction with other returning students from all over the region becomes one of the most important aspects of her campus experience.

Lucy is also interested in credit for prior life experience. Using the center's computer, she messages her interest to the appropriate electronic mailbox. Her message is acknowledged and information is sent electronically to the center's printer. She is also given the mailbox number of a counselor who can work with her on developing her portfolio if she decides to pursue this option.

Halfway into the semester, Lucy finds that juggling family, work, and school is causing problems with her and her family. The outreach coordinator suggests she contact a campus counselor. Lucy contacts the counseling office using the center's computer. The receptionist uses electronic mail to make an appointment for her to talk with a counselor. Lucy confirms that the two-way video system will be available for that time. After discussing the problem, the counselor suggests that Lucy's family come in for several sessions. Times are arranged by the outreach coordinator so that the whole family can participate in several sessions. After several sessions, the family has developed a plan that makes it easier for Lucy to juggle her responsibilities.

Of course, scheduling the campus outreach center, the computers, and the video system is a major challenge. A computer program helps with this task, keeps student files, and monitors the center's budget.

Summary

High tech delivery mechanisms have the potential to bring a variety of educational offerings to rural adults almost regardless of where they live. In addition, the interaction of curriculum development for high tech delivery will lead to exciting new ways of structuring the learning process and, to some extent, even new course content. How technology will live up to this potential will depend on the resources available and the ways in which the delivery systems are designed. Learners and practitioners alike have identified a concern for a support system to be in place at the receiving end of the delivery system. Teachers and outreach workers require additional training and support in the development of courses that can easily be offered through high tech systems.

Appendix

Factors That Facilitate High Tech Delivery Systems

Factors Contributing to Successful High Tech Delivery

Planning: Successful high tech programs include a number of factors in the planning process. Technical assistance in the development and acquisition of hardware and software is important to the success of a project, but so is the involvement of curriculum, outreach, and content specialists in the planning effort. Planning involves a needs identification prior to equipment acquisition. Hardware/software is then purchased according to its ability to meet specific needs. The plan must acknowledge the need for funding, including money to support staff development and training in use of new technologies. Finally, many successful projects include representatives of the learner group in the planning process.

Learner Involvement and Support: High tech programs that provide mechanisms for learner involvement, either through two-way video or phone hook-up, are more successful than those that don't. Distance learners also need support from the institution in the form of information, access to instructors or facilitators, and help with financial aid and other kinds of paperwork.

Adequate Funding: Successful programs require support for planning, training, and staff support as well as for hardware/software acquisition.

Adequate Infrastructure: Hardware/software purchases often require special consideration of electrical and phone infrastructure. New technology that uses laser or satellite technology must also be carefully researched before acquisition.

Sufficient Lead Time: Many programs require several years to take hold and for learners to learn to access the program. The example of Alaska illustrates that acclimating a community of learners to high tech methods of educational delivery may take several years. The result, according to Ralph Eluska at the University of Alaska, is that the more they become familiar with high tech, the more they use it. He has seen a rise from 20 audioconferencing participants to over 200 in the past several years.

Curriculum Packaging and Revision: Traditional classroom teaching methods often are not appropriate to mediated learning environments. Successful programs, such as the one at Chico State, provide staff support for designing and packaging courses for use with distance delivery systems.

Factors Leading to the Failure of High Tech Delivery Systems

Learning in a Vacuum: A number of programs using high tech delivery systems have experienced high levels of student drop-out. These programs typically do not provide any real-people contact with students who, because of isolation, become discouraged and drop out.

Unstructured Learning: Many learners enjoy self-paced learning, but require a structure to help them negotiate their way through the course.

Poorly Packaged Curriculum: Traditional lecture classes do not do well in high tech systems. Many instructors require help in redesigning their content to make it interesting and understandable to distance learners.

Untrained Staff: Instructors who have not used high tech systems often require some training in what makes for an effective course delivery using high tech systems.

Lack of Coordination Among Offerings: Learners responding to the Northwest Action Agenda interview on barriers to rural education identified lack of coordination among offerings delivered via high tech as a significant barrier to obtaining a degree (Gray, 1986.).

Hardware Acquisition Without Careful Planning: Many institutions have engaged in a sort of "star wars" approach to hardware acquisition, purchasing the most popular brands of equipment without researching either potential needs or uses. Much of this equipment remains underutilized and, in many cases, additional hardware is required to meet real identified needs.

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